

BAYOU QUEUE DE TORTUE WATERSHED TMDL FOR TURBIDITY

SUBSEGMENT 050501

U.S. EPA Region 6

With cooperation from the
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EXECUTIVE SUMMARY

Section 303(d) of the Federal Clean Water Act requires states to identify waterbodies that are not meeting water quality standard and to develop total maximum daily pollutant loads for those waterbodies. A total maximum daily load (TMDL) is the amount of a pollutant that a waterbody can assimilate without exceeding the established water quality standard for that pollutant. Through a TMDL pollutant loads can be allocated to point sources and nonpoint sources discharging to the waterbody.

The Bayou Queue de Tortue watershed is segment 050501 of the Mermentau River Basin. Subsegment 050501 is comprised of Bayou Queue de Tortue and all tributaries, including Indian Bayou, Prime Gully, Coulee des Iles/Grand Marais Bayou, Lyons Point Gully, Lazy Point Canal and numerous unnamed tributaries. Bayou Queue de Tortue was listed on both the 1998 and the October 28, 1999 Court Ordered §303(d) Lists as not meeting the water quality standard for turbidity. Bayou Queue de Tortue was ranked as high priority (priority 1) on both lists for development of a Total Maximum Daily Load (TMDL).

Bayou Queue de Tortue has been heavily hydromodified in all reaches except the upper (above LA Hwy. 35) and lower (below LA Hwy. 91) reaches. The bayou and its tributaries are dominated by rice and soybean propagation. Both of these conditions have inhibited the bayous natural processes, including reaeration and fish propagation (Smythe and Malone, 1989a-a, 1990). Turbidity has been cited as a contributing factor in the bayou's inability to meet designated uses. Turbidity samples over the period of record (1/10/95 – 12/2/98) for the ambient water quality monitoring station located on Bayou Queue de Tortue exceeded the 150 NTU turbidity guideline 40% of the time. An exceedance rate of less than 30% is required to be fully supporting for turbidity.

This TMDL calls for all sources of turbidity to the bayou to meet the 150 NTU turbidity guideline. This guideline is to be applied equally to point and nonpoint sources. Turbidity exceedances are seasonal with the highest average monthly value seen in April with a 75% reduction from current ambient levels required to meet the guideline. In months immediately preceeding and following April, required reductions are in the 40% range.

1. Introduction

The Bayou Queue de Tortue sub-segment impacts from rice cultivation activities have been studied extensively by LDEQ and through nonpoint source studies conducted by the University of Southwestern Louisiana. Smythe and Malone (1990) concluded that the use impairment of streams in the Mermentau Basin may be due to the cumulative influences of agricultural nonpoint source discharges and channelization. Water quality data generated from the monitoring program on Bayou Queue de Tortue verified that “the water quality in all categories of use (fishing, recreation and irrigation) is impaired due to high turbidity” along with other causes. (Smythe and Malone, 1990)

2. Basin Description

2.1 Mermentau River Basin

The Mermentau River Basin is located in southwestern Louisiana, and it encompasses the prairie region of the state and a section of the coastal zone. The Mermentau River Basin is bounded on the north and east by the Vermilion-Teche River Basin, on the west by the Calcasieu River Basin, and on the south by the Gulf of Mexico. The Mermentau River Basin is approximately 3,710 square miles in area, excluding the gulf waters segment (LDEQ, 1996).

The slope of the land toward the Gulf is very gradual, and as a result, the streams in the Mermentau Basin are characteristically sluggish. Fish kills have been commonly reported throughout the basin. Because waterbodies in the basin have little gradient and sluggish flows, their reaeration potential is low (LDEQ, 1990a). Prior studies have shown that the water quality problems in the basin are largely due to agricultural runoff and hydrologic modification (Smythe and Malone, 1990).

2.2 Bayou Queue de Tortue Watershed, Segment 050501

This area is typical of the basin with its low relief, which is an ideal condition for agricultural use as documented in Table 1 (LDEQ, 1999). Segment 0505 is comprised of Bayou Queue de Tortue as the main stem with several tributaries. These tributaries include Indian Bayou, Prime Gully, Coulee des Iles/Bayou Grand Marais, Lyons Point Gully, Lazy Point Canal, and many unnamed tributaries.

Average annual precipitation in the segment, based on the nearest Louisiana Climatic Station in Crowley is 56.91 inches based on a 30-year record (LSU, 1999). Land use in the Mermentau River Basin is largely agricultural. Rice and soybean farming operations are the predominant land use types in the Bayou Queue de Tortue watershed. Originally, this area was covered by tall prairie grasses, among which there were scattered clumps of trees. (USDA, 1962). In the segment under study, agricultural uses account for 86.5 percent of the total segment area. Land uses in Segment 0505 are shown in Table 1 (LDEQ, 1999b).

Table 1. Land uses in Segment 0505 of the Mermentau River Basin

LAND USE TYPE	NUMBER OF ACRES	% OF TOTAL AREA
Urban	7,051	3.6
Rangeland	490	0.3
Agricultural	168,853	86.5
Forest Land	2,820	1.4
Water	4,110	2.1
Wetland	11,849	6.1
Barren Land	47	0.0
TOTAL AREA	195,220	100.0

Bayou Queue de Tortue has been heavily hydromodified in all reaches except the upper (above LA Hwy. 35) and lower (below LA Hwy. 91) reaches. In order to irrigate the rice fields, Bayou Queue de Tortue is periodically dredged. Dredging of the bayou has occurred for many years. It has altered the route and flow of the bayou. Dredging has probably reduced the bayou's abilities to perform natural processes, such as sediment transport and fish propagation (Smythe and Malone, 1989a-f, 1990).

Bayou Queue de Tortue changes significantly from its headwaters to its lower segments. According to a 1992 LDEQ report,

“the upper headwater areas above have not been hydromodified as much as lower segments. Between rivermile 22.5 and 30.7 the bayou is highly channelized, sluggish, and extremely turbid. The stream bank is extremely unstable and erosion is severe with numerous tree roots exposed and trees falling into the bayou. Between rivermile 30.7 and 16.6 the bayou is a natural unchannelized swampy area with numerous sinuosities. Dominant tree species include bald cypress, tupelo gum and other southern swamp species. Aquatic macrophytes and floating aquatic vegetation is abundant.”

2.3 Water Quality Standards

The State of Louisiana has developed Water Quality Standards for waters of the state (LDEQ, 1999a). The standards are defined according to designated uses of the waterbodies. Designated uses for Bayou Queue de Tortue from its headwaters to the Mermentau River (waterbody subsegment 050501) include primary contact recreation, secondary contact recreation, propagation of fish and wildlife, and agriculture.

Turbidity is addressed in the Louisiana Water Quality Standards at LAC 33:IX.1113.B.9.

“a) Turbidity other than that of natural origin shall not cause substantial visual contrast with the natural appearance of the waters of the state or impair any designated water use. Turbidity shall not significantly exceed background; background is defined as the natural condition of the water. Determination of background will be on a case by case basis.

- b) As a guideline, maximum turbidity levels, expressed as nephelometric turbidity units (NTU), are established and shall apply for the following named waterbodies and major aquatic habitat types of the state.
 - i) Red, Mermentau, Atachafalaya, and Vermilion Rivers and Bayou Teche **B150 NTU.**”

Waterbodies are placed on the 303(d) list based on the comparison of data from ambient monthly samples and the appropriate criteria or guidelines. Data for this purpose was collected from Bayou Queue de Tortue at water quality station 0046 north of Gueydan, Louisiana. The period of record for the station is from 1/10/95 through 12/2/98. Evaluations of this data show that 40% of all samples are greater than the 150 NTU turbidity guideline. Guidelines for assessing use support are found in the 1998 Louisiana 305 (b) report. Turbidity is designated as a secondary determinant parameter. As such, if the turbidity criteria are exceeded in 31% to 71% of the samples analyzed, the use is determined to be only Partially Supported, therefore requiring the development of a TMDL.

3. Development of the TMDL

3.1 Establishing the water quality target

Turbidity is an expression of the optical properties in a water sample that cause light to be scattered or absorbed and may be caused by suspended matter, such as clay, silt, finely divided organic and inorganic matter, soluble colored organic compounds, and plankton and other microscopic organisms. (Greenberg et al., 1992). Turbidity cannot be expressed as a load as required by TMDL regulations. To achieve a load based value, turbidity is often correlated with other common measures that may be expressed as a load. Attempts to correlate turbidity with other common measures such as flow and sediment load yielded no significant correlations. Under these circumstances, the establishment of surrogate indicators that may be expressed as a load is not appropriate. It is also not appropriate to treat turbidity as having a linear response where turbidity values would be proportional to sample dilutions. For these reasons, the 150 NTU guideline for turbidity will be used as the numeric water quality target for the TMDL.

3.2 Linking Water Quality and Pollutant Sources

Figures 1 and 2 demonstrate trends in turbidity at water quality station 0046. In Figure 1, the presence of turbidity spikes occurring in a regular cycle each April is apparent. Figure 2, a graphical presentation of the monthly average turbidity values, supports this observation. Turbidity generally exhibits a peak in April with progressively higher increases preceding it. Turbidity values are typically lower from July through January.

A number of studies have been completed by LDEQ on various segments of the bayou. These studies cite runoff into the stream from ricefield cultivation as a primary contributor of turbidity. The critical discharge periods for rice culture are 1) water leveling (field preparation); 2) planting and subsequent post-plant draining; and 3) pre-harvest. (Smythe and Malone, 1990). The post plant draining, which usually occurs in April-May, has been documented to have the most deleterious effect on the receiving water body because these discharges are contaminated with sediment (Smythe and Malone, 1990). During April and May, large volumes of very turbid water have been observed flowing downstream in these waterbodies (streams with rice field

discharges) and this has been associated with planting activities in adjacent rice fields (LDEQ, 1990a).

3.3 Load Allocations

Sources of turbidity directly contributing to non-compliance with the state water quality standards in Bayou Queue de Tortue are overwhelmingly diffuse in origin. The load allocation portion of this TMDL includes nonpoint source and background contributions. Because there is no established relationship between turbidity and sediment loads (TSS) it is currently not possible to allocate a sediment load that would lead to compliance with the turbidity standard. For this reason, it is proposed that all sources of turbidity into Bayou Queue de Tortue be limited to the 150 NTU target. This will provide a design target for development of nonpoint source control BMPs and other actions to be taken to reduce turbidity in the bayou. Turbidity is a simple and inexpensive field measure that can provide immediate feedback for evaluation of BMP effectiveness.

Reductions from current turbidity levels will be required. Figure 2 shows that on average the turbidity guideline is being maintained in all months except February through May. Increased turbidity values in these months are attributed to increased turbulence from higher stream flows and land cultivation activities related to rice farming. Application of the 150 NTU guideline will require reductions of 40% based on monthly averages for the months of February, March and May. Reductions during the month of April are significantly higher at 75%.

Mean turbidity for February, March, and May: 250 NTU

$$(250 \text{ NTU} - 150 \text{ NTU}) / 250 \text{ NTU} = 40\% \text{ reduction}$$

Mean turbidity for April: 600 NTU

$$(600 \text{ NTU} - 150 \text{ NTU}) / 600 \text{ NTU} = 75\% \text{ reduction}$$

3.4 Waste Load Allocation

The waste load allocation (WLA) will be set to 150 NTU for point sources as well. No significant sources of excess turbidity have been documented from point sources. It is not anticipated that any reductions will be required under the WLA portion of the TMDL.

3.5 Seasonality and Margin of Safety

The Clean Water Act requires the consideration of seasonal variation of conditions affecting the constituent of concern, and the inclusion of a margin of safety (MOS) in the development of a TMDL. For the Bayou Queue de Tortue TMDL, an analysis of long-term ambient data has been employed to determine critical seasonal conditions. Margin of safety is intended to address uncertainty in the TMDL process. As used in this TMDL, a long-term data set will typically reduce uncertainty allowing for a reduced margin of safety. An implicit margin of safety was used in this TMDL.

From evaluations of average monthly turbidity values, the critical season has been defined as the months of February through May, with April being the most critical month. The margin of safety incorporated into this TMDL is implicit. This implicit MOS comes from conservative applications. Assessment procedures for compliance with this standard recognize a 30% exceedance rate as acceptable. Setting the allowable turbidity levels from sources at 150 NTU at all times is a conservative application of the guideline as no exceedances of the criterion will be allowed.

4. Other Relevant Information

Although not required by this TMDL, LDEQ utilizes funds under Section 106 of the federal Clean Water Act and under the authority of the Louisiana Environmental Quality Act to operate an established program for monitoring the quality of the state's surface waters. The LDEQ Surveillance Section collects surface water samples at various locations, utilizing appropriate sampling methods and procedures for ensuring the quality of the data collected. The objectives of the surface water monitoring program are to determine the quality of the state's surface waters, to develop a long-term data base for water quality trend analysis, and to monitor the effectiveness of pollution controls. The data obtained through the surface water monitoring program is used to develop the state's biennial 305(b) report (*Water Quality Inventory*) and the 303(d) list of impaired waters. This information is also utilized in establishing priorities for the LDEQ nonpoint source program.

The LDEQ has implemented a watershed approach to surface water quality monitoring. Through this approach, the entire state is sampled over a five-year cycle with two targeted basins sampled each year. Long-term trend monitoring sites at various locations on the larger rivers and Lake Pontchartrain are sampled throughout the five-year cycle. Sampling is conducted on a monthly basis or more frequently if necessary to yield at least 12 samples per site each year. Sampling sites are located where they are considered to be representative of the waterbody. Under the current monitoring schedule, targeted basins follow the TMDL priorities. In this manner, the first TMDLs will have been implemented by the time the first priority basins will be monitored again in the second five-year cycle. This will allow the LDEQ to determine whether there has been any improvement in water quality following establishment of the TMDLs. As the monitoring results are evaluated at the end of each year, waterbodies may be added to or removed from the 303(d) list. The sampling schedule for the first five-year cycle is shown below. The Mermentau River Basin will be sampled again in 2003.

1998 – Mermentau and Vermilion-Teche River Basins
1999 - Calcasieu and Ouachita River Basins
2000 – Barataria and Terrebonne Basins
2001 – Lake Pontchartrain Basin and Pearl River Basin
2002 – Red and Sabine River Basins

(Atchafalaya and Mississippi Rivers will be sampled continuously.)

In addition to ambient water quality sampling in the priority basins, the LDEQ has increased compliance monitoring in those basins, following the same schedule. Approximately 1,000 to

1,100 permitted facilities in the priority basins were targeted for inspections. The goal set by LDEQ was to inspect all of those facilities on the list and to sample 1/3 of the minors and 1/3 of the majors. During 1998, 476 compliance evaluation inspections and 165 compliance sampling inspections were conducted throughout the Mermentau and Vermilion-Teche River Basins.

5. Public Participation

When EPA establishes a TMDL, 40 C.F.R. § 130.7(d)(2) requires EPA to publicly notice and seek comment concerning the TMDL. Pursuant to an October 1, 1999, Court Order, EPA prepared this TMDL. After submission of this TMDL to the Court, EPA commenced preparation of a notice seeking comments, information and data from the general and affected public. Comments and additional information were submitted during the public comment period and this Court Ordered TMDL was revised accordingly. EPA has transmitted this revised TMDL to the Court, and to the Louisiana Department of Environmental Quality (LDEQ) for incorporation into LDEQ's current water quality management plan.

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Figure 1. Seasonal trends in turbidity at Bayou Queue de Tortue near Gueydan.

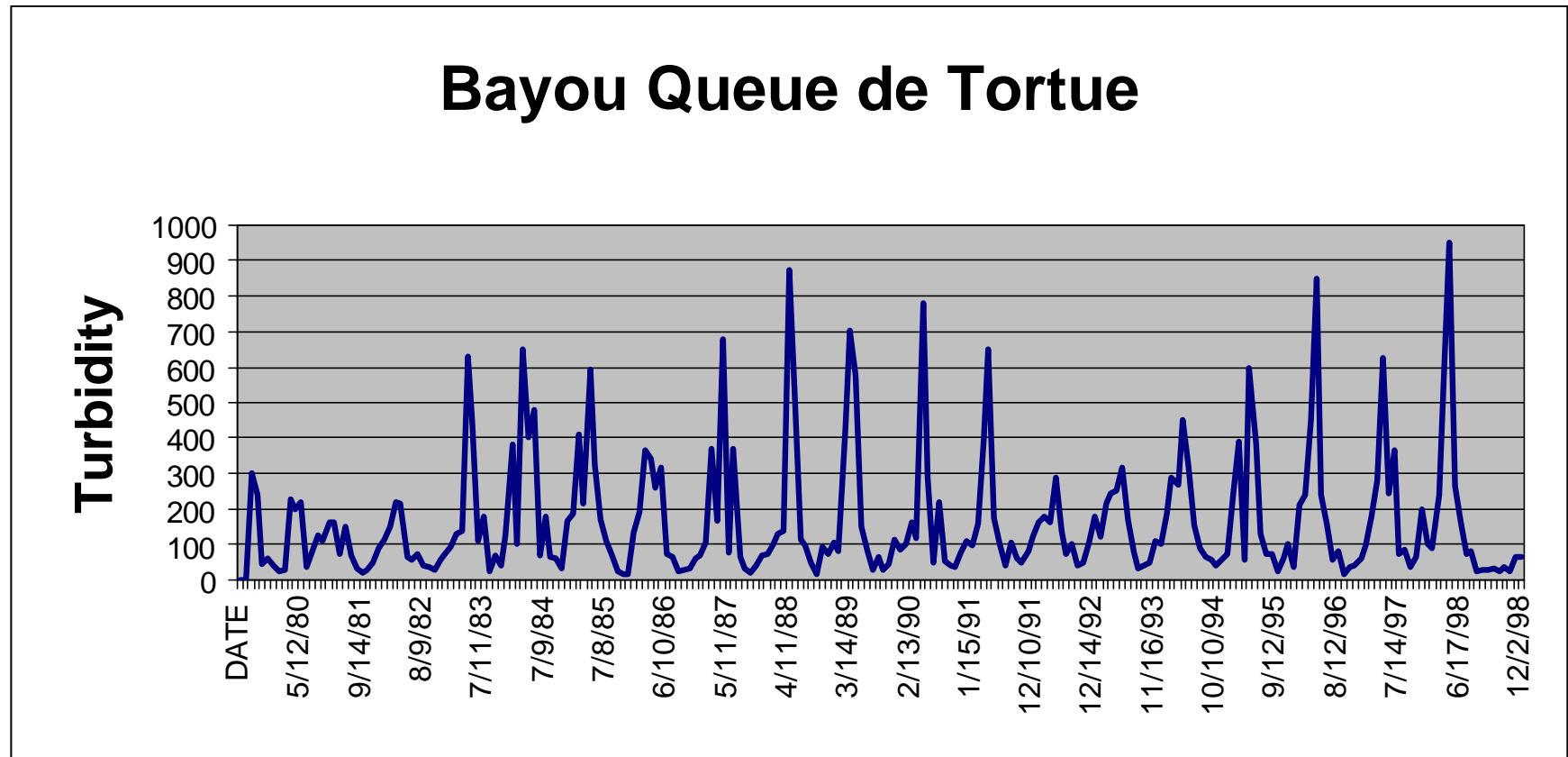


Figure 2. Mean turbidity by month at Bayou Queue de Torture near Gueydan (based on a 20 year period of record, 1978 – 1998).

